REMARKS

Applicants are amending their claims in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants have amended claim 1 to recite that each of m and n represents independently an integer of 1 or 2, that each of the Rs represents independently hydrogen, a methyl group or an ethyl group, and that each of R^1 and R^2 independently represents a fluoroalkyl group having 1-3 carbon atoms. See, for example, paragraph [0042] on page 14 of the Applicants' Substitute Specification submitted with the Preliminary Amendment filed July 12, 2006 (hereinafter "Applicants' Substitute Specification"). Claim 6 has been amended to recite that X^- represents "a" counteranion; and that "each of" R^3 and R^4, and "each of" a and b, represents specified values.

In addition, Applicants are adding new claims 11-15 to the application. Claim 11, dependent on claim 1, recites that in formula (II), each of the Rs is hydrogen. Claims 12 and 13, each dependent on claim 1, define amount of the compound represented by the general formula (II) included in the composition, consistent with the description in paragraph [0045] on page 15 of Applicants' Substitute Specification. Claims 14 and 15, each dependent on claim 8, respectively recites that the development is performed using an alkali aqueous developing solution; and recites that the heat treating is performed at a temperature in a range of 150°-450°C. Note, for example, paragraphs [0063] and [0064] on pages 18 and 19 of Applicants' Substitute Specification.

The objection to claims 1 and 6, set forth in Item 3 on page 2 of the Office Action mailed October 15, 2008, is noted. Applicants have amended each of claims 1 and 6 to specify that "each of" the recited parameters independently "represents" the recited values. In view of present amendments to claims 1 and 6, it is

respectfully submitted that the objection thereto has been overcome, and the required correction made.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the references applied by the Examiner in rejecting claims in the Office Action mailed October 15, 2008, that is, the teachings of U.S. Patent Application Publication No. 2003/0204117 to Matsuishi, et al., and Japanese Patent Document No. 2001-312063 (designed by the Examiner as "Tadayuki, et al."), under the provisions of 35 U.S.C. §102 and 35 U.S.C. §103.

It is respectfully submitted that the teachings of these applied references do not disclose, nor would have suggested, such a photosensitive polymer composition as in the present claims, including, in addition to the recited polyamide and the compound which generates an acid upon receiving light, the compound represented by the general formula (II) in claim 1, including wherein each of the Rs of this compound represents independently hydrogen, a methyl group or an ethyl group.

As will be shown in the following, it is respectfully submitted that the teachings of the applied references, particularly of Tadayuki, et al., describing many different materials for the component (c), would not have led one of ordinary skill in the art to the specific photosensitive polymer composition of the present claims, including the compound represented by the general formula (II) as discussed in the immediately proceeding paragraph; and, in any event, the teachings of the applied references would have neither disclosed nor would have suggested unexpectedly better results achieved by the presently claimed composition, including the component (c), particularly with respect to sensitivity of the composition.

Furthermore, it is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested such a method

of producing a pattern including applying the photosensitive polymer composition according to claim 1 on a support substrate, with subsequent light exposure, development and heat treatment (see claim 8); or the electronic part including an electronic device having a layer of a pattern obtained by the method according to claim 8 (see claim 10).

In addition, it is respectfully submitted that the teachings of these applied references would have neither disclosed nor would have suggested such a photosensitive polymer composition as in the present claims, having features as discussed previously in connection with claim 1, and, additionally, wherein each of the Rs is hydrogen (wherein the compound represented by the general formula (II) includes hydroxymethyl groups). See claim 11; note also claim 2.

Furthermore, it is respectfully submitted that the teachings of these applied references would have neither disclosed nor would have suggested such a photosensitive polymer composition as in the present claims, having features as discussed previously in connection with claim 1, and, additionally, wherein the compound represented by the general formula (II) is that compound set forth respectively in claims 2 and 3; and/or amounts of components in the composition as in claims 4, 12 and 13.

Moreover, it is respectfully submitted that the teachings of these applied references would have neither disclosed nor would have suggested such method of producing a pattern, having features as discussed previously in connection with claim 8, and, additionally, wherein the exposure light source used in the step of exposure generates i-line (see claim 9); and/or wherein the developing is performed utilizing an alkali aqueous developing solution (see claim 14); and/or wherein the heat treating is performed at a temperature in a range of 150°-450°C (see claim 15).

In addition, it is respectfully submitted that the teachings of these applied references would have neither disclosed nor would have suggested such photosensitive polymer position as in the present claims, having features as discussed previously in connection with claim 1, and, additionally, wherein the composition further includes a compound (component (d)) which reduces solubility of the component (a) with respect to an alkali aqueous solution (note claim 5); in particular, wherein this compound which reduces solubility of the component (a) is a diaryliodonium salt represented by the general formula (III) in claim 6, or wherein amounts of components (b)-(d) are those set forth in claim 7.

The present invention relates to a photosensitive polymer composition, a method of producing a pattern using such composition and electronic parts formed by such method using this composition. In the electronic part, the pattern formed of the composition remains as a component of the electronic part. The composition becomes a polybenzoxazole heat resistant polymer by heat treatment, and can be used, to be illustrative and not to be limiting, as a surface protection film and/or an interlayer insulating film in electronic parts such as semiconductor devices.

Conventionally, polyimide has been widely used as a surface protection or interlayer insulating film, due to advantages in resistance to heat, and advantages in mechanical properties and electrical properties, as well as easy film formability and ability to be planarized. Photosensitive polyimide compositions have use, e.g., in order to avoid the need of a photoresist. In addition, as described in paragraph [0007] on pages 2 and 3 of Applicants' Substitute Specification, positive type photosensitive polyimides have been proposed.

However, such previously proposed polyimide compositions have low sensitivity, because they are sensitive to wavelengths mainly of 300nm or less. In particular, it is difficult to use such compositions with i-line steppers, which have a

single wavelength of light at 365nm, recently used in, e.g., manufacture of electronic parts.

While it has been proposed to add a phenol binuclear compound for enhancing sensitivity of compositions including a polyimide precursor, when the phenol binuclear compound is added the pattern is easily deformed by melting of the phenol compound in a thermal cure process after development, resulting in a problem such as degradation of resolution. Thus, it has been difficult to provide a photosensitive polymer composition having sufficient sensitivity, yet which does not cause pattern deformation in the thermal cure process after development.

Against this background, Applicants provide a photosensitive polymer composition having both high sensitivity and which gives a pattern that retains its form in a step of thermal curing; that is, which provides a pattern having a high resolution and good shape, yet wherein the composition has high sensitivity. Applicants have found that by incorporating the component (c) in the composition which includes the recited polyamide component (a) and the compound (b) which generates an acid upon receiving light, the component (c) increases a dissolving speed of the exposed portion to enhance the sensitivity when developed in the alkali aqueous developing solution. Note paragraph [0042] on page 14 of Applicants' Substitute Specification. See also paragraphs [0014]-[0016] on page 7 of Applicants' Substitute Specification.

As to unexpectedly better results achieved by the presently claimed composition, including the specific compound (c) recited in the present claims, attention is respectfully directed to the enclosed "Additional Comparative Example A" and "Additional Comparative Example B". Additional Comparative Example A provides a photosensitive polymer composition obtained utilizing the same components, combined amounts and procedures as in Example 1 of the above-

identified application (see paragraphs [0086] and [0087] on pages 25 and 26 of Applicants' Substitute Specification), except that bis (2-hydroxy-3-methoxymethyl-5-methyphenyl) methane, the compound used in Examples 1 and 3 in Tadayuki, et al., was used in place of 2, 2-bis [3, 5-bis(hydroxymethyl)-4-hydroxyphenyl]-1,1,1,3,3,3-hexafluoropropane used in Example 1 of the above-identified application. Similarly, Additional Comparative Example B tested a photosensitive polymer composition obtained by the same constitution, combined amounts and procedures as in Example 1 of the present application, except that bis(2-hydroxy-3-ethoxymethyl-5-methylphenyl)methane, the compound used in Example 2 in Tadayuki, et al., was used in place of 2,2-bis[3,5-bis (hydroxymethyl)-4-hydroxyphenyl]-1,1,1,3,3,3-hexafluoropropane used in Example 1 of the above-identified application.

Note that in Additional Comparative Example A, proper exposure amount was determined to be 330 mJ/cm^2, and sensitivity was not so high; similarly with Additional Comparative Example B, proper exposure amount was determined to 320 mJ/cm^2, and sensitivity was also not so high.

Compare with the results in Example 1 of Applicants' Substitute Specification, in paragraphs [0086] and [0087] on pages 25 and 26 of Applicants' Substitute Specification. It is respectfully submitted that this data shows unexpectedly better results achieved by the present invention, utilizing the component (c) together with component (a) and (b) as in the present claims, providing a clear basis for a conclusion of patentability of the presently claimed subject matter.

Tadayuki, et al. discloses a positive type photosensitive polymer composition that contains (a) a polyamide having repeating units of a formula (I) as on page 2 of this patent document; (b) a compound which generates an acid under light; and (c) a compound having alkoxymethyl and phenolic hydroxyl groups in one molecule. Note, for example, paragraphs [0008]-[0010] of the machine-generated English

translation of Tadayuki, et al. See also paragraphs [0037] and [0038] of this patent document, further describing this compound which has two or more alkoxymethyl groups and phenolic hydroxyl groups. Note also the Example of Tadayuki, et al., beginning in paragraph [0059] thereof.

Noting especially the Example in Tadayuki, et al., it is respectfully submitted that this reference would not have guided one of ordinary skill in the art to the photosensitive polymer composition as in the present claims, including the component (c) especially wherein each of the Rs represents independently hydrogen, a methyl group or an ethyl group (claim 1), more particularly wherein each of the Rs represents hydrogen (note claim 11; see also claim 2); and, especially, unexpectedly better results achieved by the present invention utilizing the component (c) as in the present claims. In this regards, it is emphasized that the photosensitive polymer composition of present claim 11 does not fall within the scope of the broad disclosure in Tadayuki, et al. In this regard, note also claim 2.

It is respectfully submitted that the additional teachings of Matsuishi, et al., would not have rectified the deficiencies of Tadayuki, et al., such that the presently claimed invention as a whole would have been obvious to one of ordinary skill in the art.

Matsuishi, et al. discloses hydroxymethyl-substituted polyfunctional phenols, wherein one phenol nucleus contains two hydroxymethyl groups as nucleus substitution groups. Note especially paragraphs [0008]-[0019] on page 1 of this patent document. This patent document goes on to describe, in paragraph [0044] on page 4 thereof, that compounds described therein can be used as photoresist material or to derive polyphenol compounds through further reaction with phenolic compounds; and that the compounds are also usable as compounding agents that

add to the molecular weight of novolac phenol resins or as hardening agents for epoxy resins used in casting and powder coating.

Initially, it is noted that Tadayuki, et al., is concerned with photosensitive polymer compositions and methods for forming patterns, remaining in the formed device, using such compositions; while Matsuishi, et al., is concerned with specific compounds that can be used as photoresist materials or to derive polyphenol compounds through further reaction with phenolic compounds, among other uses. Tadayuki, et al. is directed to providing a photosensitive polymer composition having high sensitivity, among other properties, while Matsuishi, et al. is concerned with providing, among other materials, photoresist materials providing chemical reactions with phenols. In view of different technologies involved with in these two references, as well as different problems addressed by each, it is respectfully submitted that one of ordinary skill in the art concerned with in Tadayuki, et al. would not have looked to the teachings of Matsuishi, et al. In other word, it is respectfully submitted that these references are directed to non-analogous arts.

Furthermore, different problems addressed by Tadayuki, et al. and by Matsuishi, et al., discussed previously, are again noted. Particularly in view thereof, it is respectfully submitted that the Examiner has pointed to no proper reason for combining the teachings of these references.

In this regard, contentions by the Examiner in the last paragraph on page 5 of the Office Action mailed October 15, 2008, are noted; and, in particular, the contention by the Examiner that it would have been obvious "to substitute the functional equivalent compound of [Matsuishi, et al.] as a component (c) of [Tadayuki, et al.]", the Examiner contending that the compounds are analogs, is noted. It is emphasized that Tadayuki, et al. discloses a positive type photosensitive polymer composition; and, in particular as set forth in claim 10, for example, the

product formed by the composition remains as part of the electronic part. It is respectfully submitted that the Examiner errs in concluding that both Tadayuki, et al. and Matsuishi, et al. are drawn to photoresist materials.

Moreover, it is respectfully submitted that Matsuishi, et al., either alone or together with the teachings of Tadayuki, et al., would not have disclosed, nor would have suggested use of compounds of Matsuishi, et al., as the component (c) of the photosensitive polymer composition of the present claims, or, in particular, the unexpectedly better results achieved and, for example, excellent sensitivity, with component (c) used together with the components (a) and (b) as in the present claims.

In view of the foregoing comments and amendments, reconsideration and allowance of all claims presently pending in the above-identified application are respectfully requested.

Applicants request any shortage in fees due in connection with the filing of this paper be charged to the Deposit Account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (case 1270.46327X00), and credit any excess payment of fees to such Deposit Account.

Respectfully submitted,

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Attachment: Additional Comparative Example A and B

Additional Comparative Example A

A photosensitive polymer composition was obtained by the same constitution, combined amounts and procedures as in Example 1, except that bis(2-hydroxy-3-methoxymethyl-5-methylphenyl)methane (compound used in the Examples 1 and 3 in the cited JP2001-312063) was used in place of 2,2-bis[3,5-bis(hydroxymethyl)-4-hydroxyphenyl]-1,1,1,3,3,3-hexafluoropropane used in Example 1.

The obtained photosensitive polymer composition was applied on the rotating silicon wafer by a spinner, and heated and dried on a hot plate at 120°C for 3 minutes to obtain a coating film of 11.9 μm. An exposure treatment was given to this coating film via a reticle by using an i- line stepper (supplied from Canon Inc.) as an exposure apparatus and changing exposure amounts in the range of 100 to 810 mJ/cm^2 with an increment of 10 mJ/cm^2. Then, a paddle development for 80 seconds was performed using an aqueous solution of 2.38% by weight of tetramethyl ammonium hydroxide as a developing solution, and the coating film was washed with purified water to obtain patterns. The proper exposure amount was determined to be 330 mJ/cm^2 by observing the obtained patterns, and the sensitivity was not so high. It was confirmed that the pattern having a good shape down to a dimension of 3 μm was formed by this exposure amount. A film remaining ratio in an unexposed portion was 81%.

Additional Comparative Example B

A photosensitive polymer composition was obtained by the same constitution, combined amounts and procedures as in Example 1, except that bis(2-hydroxy-3-ethoxymethyl-5-methylphenyl)methane (compound used in the Example 2 in the cited JP2001-312063) was used in place of 2,2-bis[3,5-bis(hydroxymethyl)-4-hydroxyphenyl]-1,1,1,3,3,3-hexafluoropropane used in Example 1.

The obtained photosensitive polymer composition was applied on the rotating silicon wafer by a spinner, and heated and dried on a hot plate at 120°C for 3 minutes to obtain a coating film of 12.0 μm. An exposure treatment was given to this coating film via a reticle by using an i- line stepper (supplied from

Canon Inc.) as an exposure apparatus and changing exposure amounts in the range of 100 to 810 mJ/cm^2 with an increment of 10 mJ/cm^2. Then, a paddle development for 80 seconds was performed using an aqueous solution of 2.38% by weight of tetramethyl ammonium hydroxide as a developing solution, and the coating film was washed with purified water to obtain patterns. The proper exposure amount was determined to be 320 mJ/cm^2 by observing the obtained patterns, and the sensitivity was not so high. It was confirmed that the pattern having a good shape down to a dimension of 3 μm was formed by this exposure amount. A film remaining ratio in an unexposed portion was 79%.